

REMARKS

Claims 1-17, 19-21 and 23-38 are now pending in the application. Claims 18 and 22 have been cancelled. Applicants note that the specification has been amended to correct minor informalities. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-15 and 17-38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 1009051 in view of Petrie (*Handbook of Sealants and Adhesives*, 2000, hereinafter “Petrie”). Claim 16 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 1009051 in view of Petrie, and further in view of Fronk et al. (U.S. Pat. No. 6,372,376, hereinafter “Fronk”). These rejections are respectfully traversed.

At the outset, Applicants note that claims 1, 23, 24 and 29 have been amended to clarify that the electrically conductive adhesive has a low glass transition temperature. This limitation was previously rejected by the examiner in claim 18. However, Applicants believe that the combination of an electrically conductive primer and a low glass transition temperature (T_g) adhesive is novel and nonobvious. The combination of this adhesive having a low T_g and the electrically conductive primer provides lower and more durable electrical bondline resistance than simply using the adhesive alone. In the past, adhesives having a higher T_g were used for bonding first and second conductive sheets. The electrical bondline resistance for these high T_g adhesives is extremely sensitive to the “quality” of the bond, i.e., a slight amount of

debonding at the adhesive/substrate interface results in a significant increase in bondline resistance. In contrast, the bondline resistance for low T_g adhesives is not as sensitive to the quality of the bond, particularly when a conductive primer is used. As a result of this sensitivity, high T_g adhesives have exhibited long-term durability problems on metal bipolar plates in a fuel cell stack in which the bond quality is degraded during thermal and humidity soaking/cycling. The present invention addresses this durability issue. The lower T_g adhesives of the present invention are much less rigid at fuel cell stack temperatures than the higher T_g versions, resulting in fewer high-localized stresses in the adhesive bondline when thermocycled, better adhesion to the substrate, and lower and more durable electrical bondline resistances. Moreover, by using an electrically conducting primer that maintains a high metal substrate conductivity in combination with a low T_g adhesive the bondline resistance remains low even if the bond quality is slightly degraded. Furthermore, by having a conductive primer on the plate surface, lower compression pressures are required during the bonding operation to achieve the targeted low bondline resistances. This results in reduced residual bondline stresses and, in turn, a lesser degree of debonding during thermal cycling. As such, the present invention provides an adhesive and primer combination that results in greater durability without sacrificing bondline resistance performance, overcoming the deficiencies in the prior art.

The Examiner acknowledges that EP 1009051 does not disclose that the sheets are coated with an electrically conductive primer. Applicants note that the Petrie reference does not suggest or provide motivation for an electrically conductive primer in combination with an electrically conductive adhesive. The Examiner has stated that

Petrie suggests the use of an electrically conductive primer since “[r]esins, curing agents, and additives used in primer formulation are much like adhesive or sealant formulations except for the addition of solvents or low viscosity resins to provide a high degree of flow” (Petrie, p. 263). However, Applicants respectfully submit that this is hindsight reasoning. The Examiner further notes that “[t]he conductive adhesive may also be used to coat the entire heat exchange faces to provide a corrosion protection factor” (EP 1009051, paragraph 17). Applicants note that neither Petrie nor EP 1009051 suggest the use of an electrically conductive primer in combination with an electrically conductive adhesive.

Specifically, Petrie merely discloses that a primer may be made from a substance similar to an adhesive to prevent corrosion. While the adhesive may be used as a corrosion preventing agent for the faces, the present invention is concerned with decreasing the rate of increase in bondline resistance over time. In the present invention a primer is applied to a surface and an adhesive is applied to that primed surface to achieve this goal. The EP 1009051 reference appears only to teach applying the adhesive as a corrosion inhibitor, not as a primer at an attachment location for increasing bondline stability.

Applicants note that the bondline resistance characteristics disclosed by the present invention are not taught by the combination of Petrie and EP 1009051. Applicants believe that the combination of the electrically conductive adhesive and electrically conductive primer provide a novel benefit of increasing bondline stability. “The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the

desirability of the modification.” In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992) (Citing In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)). Applicants further note that hindsight may not be used to render a combination obvious. “To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.” In re Fine, 837 F.2d 1071, 1075, 5USPQ2d 1596, 1600 (citing W.L. Gore v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (fed. Cir. 1983)). As a result, Applicants believe that the claims are currently in condition for allowance.

Applicants note that claims 2-17 and 19-21 depend from claim 1, claims 25-28 depend from claim 24 and claims 30-38 depend from claim 29. As such, Applicants believe that these claims are in condition for allowance for the reasons set forth above regarding claims 1, 23, 24 and 29. In view of the above remarks, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 1-38 under 35 U.S.C. §103(a).

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt

and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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